

Platelet Indices in Dengue Patients Stratified by Platelet Count in a Tertiary Care Hospital of Khulna City of Bangladesh



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Abstract

Background: Dengue fever is a major public health problem in tropical countries and is commonly associated with hematological abnormalities, particularly thrombocytopenia. Platelet indices such as mean platelet volume (MPV), platelet distribution width (PDW), and plateletcrit (PCT) are routinely available parameters that may help in assessing disease severity and monitoring patients with dengue infection.

Objective: The purpose of the present study was to evaluate platelet indices in dengue patients stratified according to platelet count in a tertiary care hospital in Khulna, Bangladesh. **Methodology:** This cross-sectional study was conducted at Gazi Medical College Hospital, Khulna, Bangladesh from August to December 2025. A total of 100 serologically confirmed dengue patients aged more than or equal to 18 years were enrolled. Patients were categorized into groups based on platelet count, such as less than 20,000/cumm, 20,000 to 50,000/cumm, 50,000 to 100,000/cumm, 100,000 to 150,000/cumm, and more than 150,000/cumm. Hematological parameters, including platelet count, MPV, PDW, and PCT, were obtained using an automated hematology analyzer. Data were analyzed using SPSS version 21. As data were non-normally distributed, results were expressed as median (IQR), and comparisons among groups were performed using the Kruskal–Wallis test. **Results:** Among the 100 patients, 55.0% were male and 45% female. The majority of the patients were recorded in the 31 to 40 years age group (28.0%), followed closely by the 21 to 30 years age group (26.0%). Most cases were dengue fever (79.0%), followed by dengue hemorrhagic fever (18.0%) and dengue shock syndrome (3.0%). The median platelet count was 57,500/cumm (IQR: 30,000–89,750). Plateletcrit showed a highly significant association with platelet count ($p < 0.001$), with progressively increasing values across higher platelet count groups. In contrast, MPV ($p = 0.306$) and PDW ($p = 0.302$) did not show significant associations with platelet count. **Conclusion:** Among the platelet indices, plateletcrit demonstrated a strong and significant correlation with platelet count in dengue patients. Plateletcrit may serve as a useful adjunct parameter in monitoring thrombocytopenia and disease progression in dengue infection. [Bangladesh Journal of Infectious Diseases, June 2026;13(1):360-366]

Keywords: Dengue fever; Platelet indices; Plateletcrit; Mean platelet volume; Platelet distribution width; Thrombocytopenia

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Introduction

Dengue is a mosquito-transmitted viral disease affecting millions of people worldwide and is responsible for approximately 30,000 deaths annually (2.5% mortality rate)¹. The global prevalence of dengue infection has increased dramatically in recent decades². In Bangladesh, cumulative cases and deaths of dengue patients were 24,183 and 101, respectively³.

Dengue virus is an ssRNA virus of the Flaviviridae family which is transmitted by the bite of *Aedes aegypti* and *Aedes albopictus* mosquitoes⁴. Among 105 million dengue-infected people, only 51 million are symptomatic⁵. Symptomatic dengue patients can develop a wide range of clinical features like influenza-like illness (dengue fever-DF), which may progress to dengue hemorrhagic fever (DHF) and dengue shock syndrome (DSS)⁶. For this reason, it is of utmost importance to detect dengue patients as early as possible. At the same time, the severity of dengue patients should be evaluated simultaneously for timely treatment⁷. As proper monitoring of disease progress can ensure effective management, prognostic indicators of dengue infection should be available and accessible even in primary health care to reduce the dengue fever-related mortality rate⁸.

The diagnosis of dengue fever is mainly based on clinical presentation, epidemiological data and laboratory investigation. Among laboratory investigations, the key hematology parameters of interest are platelet indices, total leucocyte count (TLC) and hematocrite⁶. The hematological parameters in dengue patients change during the course of the disease such as classical dengue fever, dengue hemorrhagic fever, and dengue shock syndrome⁹. Progressive leucopenia with thrombocytopenia is one of the earliest prognostic factors of severe dengue infection¹⁰. Hence, they can play a key role in detecting and monitoring potential dengue cases, especially when combined with other clinical signs⁹.

Recent studies suggest that platelet indices such as mean platelet volume (MPV), platelet distribution width (PDW) and plateletcrit are being used as prospective platelet activation markers that can serve as useful laboratory markers in the evaluation of dengue infection¹¹. Moreover, these indices are routinely reported by most automated and semi-automated hematology analyzers used in clinical practice as a part of the complete blood count without any extra cost¹².

Mean platelet volume (MPV) is a marker of platelet function and activity which is obtained by

laboratory haematology analysers¹³. It is a useful independent predictor of bleeding which reflects bone marrow activity¹¹. Platelet distribution width (PDW) directly measures variability in platelet size and the heterogeneity in platelet morphology, which suggests platelet activation¹⁴. Plateletcrit (PCT) is a measurement of total platelet mass, which is useful for detection of quantitative abnormalities of platelets^{12,13,15}.

All these parameters help to assess, solely or in combination, to predict the disease severity in dengue infection and decide the need for transfusion as well¹⁴. The clinical relevance and interpretative usefulness of these parameters have not yet been fully determined¹². A systematic, hospital-based evaluation of these hematological markers can identify which parameters change earliest, which best predict severity, and how laboratory parameter trends may be used to monitor patients during hospitalization¹⁶. However, despite advances in diagnostic techniques and therapeutic strategies, there are limited studies from Khulna, Bangladesh, regarding dengue fever and its relationship with platelet parameters.

In this context, the present study was undertaken to assess platelet parameters in patients with dengue fever in a tertiary care hospital, Khulna. The findings of this study may contribute to improving clinical assessment and management of patients with dengue infection in both current practice and future clinical settings.

Methodology

Study Settings and Population: This cross-sectional study was conducted in the Department of Pathology, in collaboration with the Department of Microbiology and Medicine, Gazi Medical College Hospital, Khulna, Bangladesh, from August to December, 2025. Around 100 dengue patients admitted to Gazi Medical College Hospital, Khulna, Bangladesh during the study period were enrolled by purposive sampling. Total Dengue patients were divided into three groups according to clinical presentation¹⁷.

Selection Criteria: All patients of both genders and aged 18 years and above diagnosed with dengue either by NS1 antigen or IgM or both were included in the study. Patients with suspected coinfection and pre-existing hematological disorders, malignancy, and DIC were excluded from the study.

Study Groups: The study participants were categorized into four groups according to the clinical classification of dengue infection, such as Group A comprised patients with dengue fever

(DF), Group B included patients with dengue hemorrhagic fever (DHF), Group C consisted of patients with dengue shock syndrome (DSS), and Group D included patients presenting with expanded dengue syndrome (EDS).

Procedure of Laboratory Tests: Serological confirmation of dengue infection was performed by detecting dengue NS1 antigen and anti-dengue IgM antibody in serum samples using an immunochromatographic assay. Complete blood count (CBC) estimation was carried out for all patients using SYSMEX Automated Hematology Analyzer (Model: XN-550). The hematological parameters, including hemoglobin (Hb), hematocrit, total platelet count, mean platelet volume (MPV), platelet distribution width (PDW), and plateletcrit (PCT) were collected from the CBC report. Universal precautions were obtained. Gloves, lab coat, and safety glasses were worn when handling all human blood products.

Statistical Analysis: All Data were analyzed by using window-based computer software developed with Statistical Packages for the Social Sciences (IBM SPSS Statistics 21 version). Categorical variables, including gender distribution and types of dengue infection (DF, DHF and DSS) were summarized as frequencies and percentages and presented using pie charts. Continuous variables were assessed for normality using the Shapiro–Wilk test and visual inspection. As the data were not normally distributed, continuous variables were expressed as median with interquartile range (IQR). Baseline clinical and hematological characteristics of the patients were described using median (IQR). Platelet count was categorized into predefined groups such as less than 20,000/cumm, 20,000 to 50,000/cumm, 50,000 to 100,000/cumm, 100,000 to 150,000/cumm, and more than 150,000/cumm. Platelet indices, including platelet distribution width (PDW), plateletcrit (PCT), and mean platelet volume (MPV) were compared across the dengue patients with these platelet count groups. As the data were non-normally distributed, comparisons of platelet indices among different platelet count groups were performed using the Kruskal–Wallis’s test. A p-value of <0.05 was considered statistically significant for all analyses.

Ethical Consideration: Prior to the commencement of this study, the research protocol was approved by the Institutional Review Board (IRB) of Gazi Medical College, Khulna, Bangladesh. Informed consent was obtained from

the study participants. All information collected was kept confidential. Data were collected from questionnaires and laboratory reports.

Results

A total of 100 dengue patients were enrolled in this study. In this study, all dengue patients were confirmed by either IG M antibody or NS1 positive test.

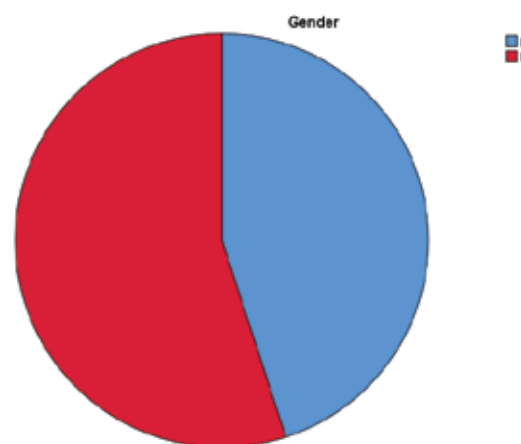


Figure 1: Gender Distribution among the Study Participants (n=100)

About 55.0% of cases were male, and 45.0% of cases were female. A slight male predominance was observed in the study (Figure 1).

Table 1: Age distribution among the Dengue Patients (n=100)

Age Group	N(%)
Less than 20 Years	13(13.0%)
21 to 30 Years	26(26.0%)
31 to 40 Years	28(28.0%)
41 to 50 Years	16(16.0%)
51 to 60 Years	10(10.0%)
More than 61 Years	7(7.0%)
Total	100(100.0%)

The highest proportion of the dengue patients belonged to 31 to 40 years age group (28.0%) followed closely by the 21 to 30 years age group (26.0%). The lowest proportion of dengue cases was observed among patients aged 61 years and above (7.0%) (Table 1).

Among 100 dengue cases, the majority of the patients had dengue fever (79.0%) followed by DHF (18.0%) and DSS (3.0%) (Figure II)

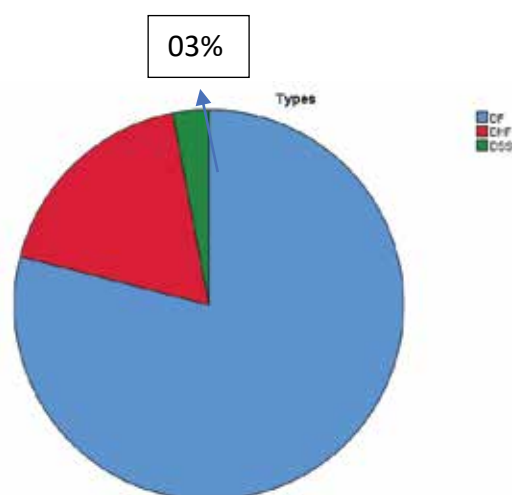


Figure II: Distribution of Dengue Patients Based on Severity (n=100)

Table 2: Baseline Hematological Characteristics of the Patients (n=100)

Parameter Median (IQR)	Parameter Median (IQR)
Hb (g/dl)	13.00 (11.72-14.6)
Hct (%)	39.80 (35.22-44.37)
WBC (/cumm)	5120 (3427-6935)
Platelet count (/cumm)	57500 (30000-89750)
Platelet distribution width (fL)	14.75 (12.22-17.87)
Plateletcrit (%)	0.06 (0.03-0.10)
Mean platelet volume (fL)	11.2 (10.42-12.37)

Table 2: Protective Immunity among Different Socioeconomic Status (n=180)

Platelet indices	N	Mean	P Value
Platelet distribution width (fL)			
Less than 20,000	11	44.64	
20,000 to 50,000	30	54.63	
50,000 to 1,00,000	41	54.21	0.302
1,00,000 to 1,50,000	12	40.79	
More than 1,50,000	06	34.67	
Plateletcrit (%)			
Less than 20,000	11	7.45	
20,000 to 50,000	30	31.75	
50,000 to 1,00,000	41	59.20	0.000
1,00,000 to 1,50,000	12	85.42	
More than 1,50,000	06	93.92	
Mean platelet volume (fL)			
Less than 20,000	11	38.59	
20,000 to 50,000	30	55.97	
50,000 to 1,00,000	41	53.09	0.306
1,00,000 to 1,50,000	12	45.42	
More than 1,50,000	06	37.50	

The baseline haematological characteristics of the patients, which reflect marked thrombocytopenia associated with alterations in platelet indices among the study population (n=100) (Table 2).

Comparison of the platelet indices (PDW, plateletcrit and MPV) among the patients with different platelet groups were analysed. Among them plateletcrit (PCT) demonstrated a highly significant association with platelet count ($p < 0.001$) (Table 3).

Discussion

In the present study, male predominance was observed to some extent (55.0%), while females constituted the rest 45% of the study population. This gender distribution is consistent with findings from several previous studies such as Rahman et al¹⁸, Hossain et al¹⁹, Ralapanawa et al²⁰ and Rashmi et al²¹. The observed male preponderance may be attributed to increased outdoor activities and occupational exposure to Aedes mosquito vectors among males, particularly in endemic regions, which enhances the risk of dengue virus transmission^{19,21}. However, the substantial proportion of female patients highlights that dengue affects both sexes significantly, emphasizing the need for preventive strategies and public health interventions that target the entire population irrespective of gender²².

In our study, dengue infection was predominantly observed among young and middle-aged adults. The highest frequency of cases was recorded in the 31 to 40 years age group (28.0%), followed closely by the 21 to 30 years age group (26.0%). This pattern suggests that individuals in the economically productive and socially active age groups are more exposed to dengue virus transmission, likely due to increased outdoor activities, occupational exposure, and greater mobility, which enhance contact with Aedes mosquito breeding environments. The lowest proportion of dengue cases was observed among patients aged 61 years and above (7.0%), possibly due to reduced outdoor activity, increased use of preventive measures or underreporting related to healthcare-seeking behaviour in the elderly population. These findings highlight the importance of targeting dengue prevention and control strategies toward young and middle-aged adults, particularly in workplace and community settings. Health education programs focusing on vector control, personal protective measures, and early healthcare-seeking behaviour should prioritize this high-risk age group to reduce disease transmission and associated morbidity. Rahman et al¹⁸ also stated that the maximum number

of cases were observed in less than 10 years, and the age range was 31 to 40 years in both male and female patients. Hossain et al¹⁹ observed that 87.4% of their study population was less than 40 years of age.

In the present study, the majority of patients were diagnosed with dengue fever (DF) (79.0%), followed by dengue hemorrhagic fever (DHF) (18.0%) and dengue shock syndrome (DSS) (3.0%), indicating that most cases belonged to the milder spectrum of the disease. There was no patient with expanded dengue syndrome (EDS). Similar observations have been reported by Anwar et al¹¹, who found that 94.41% of patients had mild dengue while only 5.6% developed severe disease. Makwana et al¹⁵ also reported that 72.0% of patients had DF, 12.0% had DHF, and 16.0% progressed to DSS. Roy et al²³ documented that 86.3% of cases were DF and 13.7% were DHF, while Kularatne et al²⁴ observed 70.0% DF and 30.0% DHF cases in their cohort. In contrast, Azin et al⁶ reported a higher proportion of severe cases, accounting for only 20(13.0%) with classical dengue, 44(28.6%) with severe dengue, and 90(58.4%) with dengue hemorrhagic fever, which comprises a larger share of patients.

The relatively lower proportion of DSS observed in this study may be attributed to early diagnosis, prompt clinical management, and improved supportive care, which helped to reduce progression to severe disease and mortality²⁵. Furthermore, host immune response, viral serotype, and the presence of secondary dengue infection are recognized determinants of disease severity, which may explain the variation in the proportion of DHF and DSS across different study populations, as in the studies of Guzman and Harris²⁶, and Martina et al²⁷.

We analysed the baseline hematological characteristics of the study participants. The median total white blood cell (WBC) count was 5,120/cumm (IQR: 3,427 to 6,935/cumm), reflecting a trend toward leukopenia, a well-recognized hematological manifestation of dengue infection. The median platelet count was 57,500/cumm (IQR: 30,000 to 89,750), indicating a predominance of thrombocytopenia among the study population, which is a hallmark laboratory feature of dengue. Regarding platelet indices, the median platelet distribution width (PDW) was 14.75 fL (IQR: 12.22 to 17.87). The median plateletcrit (PCT) was 0.06% (IQR: 0.03–0.10), suggesting a reduced total platelet mass consistent with low platelet counts. The median mean platelet volume (MPV) was 11.2 fL (IQR: 10.42–12.37). Overall, these findings characterize the study cohort as predominantly affected by thrombocytopenia with associated alterations in

platelet indices and mild leukopenia, which are consistent with other studies such as Azin et al⁶, Rao et al⁸ and Passi et al¹⁰.

The present analysis evaluated the relationship between platelet indices and dengue patients with different categories of platelet count. Comparing the platelet indices, among the group of patients based on platelet count (/cumm) such as less than 20,000; 20,000 to 50,000; 50,000 to 1,00,000; 1,00,000 to 1,50,000 and more than 1,50,000 mean platelet distribution width (PDW) were 44.64, 54.63, 54.21, 40.79 and 34.67 fL respectively. In this study, platelet distribution width (PDW) did not show a statistically significant association with platelet count across different thrombocytopenic categories ($p = 0.302$). Similar findings have been reported by Passi et al¹⁰ and Prakash and Anikethana²⁸ who also observed no consistent correlation between PDW and platelet count in dengue patients. The lack of significant association observed may be explained by the simultaneous presence of platelet destruction and impaired platelet production during the acute phase of dengue, which can mask consistent changes in platelet size heterogeneity.

In our study mean platelet volume (MPV) were 38.59, 55.97, 53.09, 45.42 and 37.50 fL among the group of patients with platelet count (/cumm) less than 20,000; 20,000 to 50,000; 50,000 to 1,00,000; 1,00,000 to 1,50,000 and more than 1,50,000 respectively. Mean platelet volume (MPV) likewise did not demonstrate a statistically significant association with platelet count in this study ($p = 0.306$). Similar observations have been reported by Paul et al¹¹, who found a negative correlation between platelet count and MPV ($r = -0.106$), which was not statistically significant ($p = 0.088$). Prakash and Anikethana²⁸, as well as Sharma and Yadav²⁹ also observed no significant relation between MPV and platelet count ($p = 0.158$). In contrast, Mukker and Kiran¹³ and Roy et al²³ demonstrated a statistically significant association between MPV and different platelet count groups ($p = 0.001$) and ($r = -0.247$, $p = 0.004$), respectively. These conflicting findings across studies may be explained by differences in disease phase at presentation, sample size, analytical methods, and variability in bone marrow response during dengue infection.

In our study, plateletcrit (PCT) demonstrated a highly significant association with platelet count ($p < 0.001$). A steady increase in mean plateletcrit was observed with rising platelet counts in accordance with 7.45, 31.75, 59.20, 85.42 and 93.92% among the group of patients based on platelet count (/cumm) such as less than 20,000; 20,000 to 50,000; 50,000 to 1,00,000;

1,00,000 to 1,50,000 and more than 1,50,000 respectively. Previous studies by Khansili and Bansal³⁰, Ahmad et al³¹ and Nehara et al³² have also stated that plateletcrit correlated strongly with platelet count. Mukker and Kiran¹³ reported a strong association between platelet count and plateletcrit ($p < 0.001$), indicating that PCT exhibits a strong positive relationship with platelet number. Ahmad et al³¹ demonstrated that the mean PCT value progressively increased with rising platelet counts, being lowest among patients with platelet counts below 25,000/cumm and significantly higher in those with raised platelet counts ($p < 0.05$). Similarly, Nehara et al³² observed a statistically significant positive correlation between plateletcrit and platelet count ($r = 0.6825$, $p < 0.0001$), emphasizing the strong linear relationship between these two parameters. The strong association observed in these studies underscores the relevance of PCT as a more sensitive and representative marker of platelet status compared to other platelet indices. Overall, the findings of this study suggest that among the platelet indices evaluated, plateletcrit is the most reliable parameter reflecting variations in platelet count, while PDW and MPV did not show significant association with platelet count. PCT showed a significant association with platelet count and may serve as a useful adjunct for monitoring platelet dynamics and disease progression in dengue infection.

There are several limitations of this study. The study was conducted in a small study population. Hence, large epidemiological, randomized, controlled studies were needed to establish the utility of platelet indices in dengue infection.

Conclusion

Dengue infection is frequently associated with thrombocytopenia and changes in platelet indices. Among the parameters studied, plateletcrit (PCT) showed a significant association with platelet count and reliably reflected variations in platelet number, whereas mean platelet volume (MPV) and platelet distribution width (PDW) did not show significant correlations. Plateletcrit (PCT) along with platelet count can be used to assess platelet status and disease severity in dengue patients.

Acknowledgements

The authors of this study are thankful to the authority of the Department of Pathology, Gazi Medical College & Hospital, Khulna, for their kind cooperation during sample collection and laboratory procedures.

Conflict of interest:

The authors declare that they have no conflicts of interest related to this study. The authors alone are responsible for the content and writing of this manuscript.

Financial Disclosure

This research project was not funded by any organization.

Authors' contributions

Conception and design: Rahman T, Al-Faroque A, Bhuiyan MMA; Acquisition, analysis, and interpretation of data: Bhuiyan MMA, Jahan M, Yasmin S; Data collection, consultation, and surgical team: Rahman T, Al-Faroque A; Manuscript drafting and critical revision: Rahman T, Al-Faroque A; All authors read and approved the final manuscript.

Data Availability

The datasets generated and analyzed during this study are not publicly available due to patient confidentiality and institutional data protection policies. However, anonymized data may be made available from the corresponding author upon reasonable request, subject to approval by the institutional ethics committee.

Ethics Approval and Consent to Participate

Ethical approval for the study was obtained from the Institutional Review Board. As this was a prospective study, written informed consent was obtained from all study participants. All methods were performed in accordance with the relevant guidelines and regulations.

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How to cite this article: Rahman T, Al-Faroque A, Bhuiyan MMA, Jahan M, Yasmin S. Platelet Indices in Dengue Patients Stratified by Platelet Count in a Tertiary Care Hospital, Khulna, Bangladesh. Bangladesh J Infect Dis 2026;13(1):360-366

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Article Info

Received on: 1 June 2025

Accepted on: 12 October 2025

Published on: 1 June 2026

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